2021

CNAHS_2018-2019_Biology_BS_Academic_Assessment_Report

Kean University

2018-2019
Academic Program Assessment Report

COLLEGE: CNAHS-SONS **B.S. in Biology Degree Program**

ACADEMIC YEAR: **2018-2019**

REPORT AUTHOR: Dr. Carisa Davis

PROGRAM STUDENT LEARNING OUTCOMES (CHECK OFF THE SLOs BEING ASSESSED)**:**

X SLO1: Acquire knowledge of fundamental principles (diversity of living organisms/biological fundamentals/evolutionary biology (Laboratory Practical: BIO 1400, Lab Report: BIO 1300 and Final Presentations Speech & Writing: BIO 4970).

X SLO2: Acquire the laboratory and field skills to gather and analyze data related to biological questions (Lab Report: BIO 1300 & Final Presentation BIO 4970).

X SLO3: Develop skills in critical thinking, scientific reasoning, and problem solving (Laboratory Practical: BIO 1400), Lab Report: BIO 1300, and (Final Presentation – Speech and Writing: BIO 4970).

X SLO4: Develop the ability to apply biological principles to understand current issues (Laboratory Practical: BIO 1400, Lab Report: BIO 1300 and Final Presentation – Speech & Writing: BIO 4970).

X SLO5: Develop the ability to apply effectively find, organize, and use resources from the literature and present results in oral, visual, and written communication (Laboratory Practical: Bio 1400, Lab Report: BIO 1300 and Final Presentation – Speech and Writing: BIO 4970).

X SLO6: Develop an awareness of careers and professions available in the biological sciences (Final Presentation – Speech & Writing: BIO 4970).

X SLO7: Acquire adequate preparation to enter health professional programs and/or the work force in related fields (Final Presentation – Speech & Writing: BIO 4970).

1. BIO 1400 Laboratory Practical Assessment

DIRECT MEASURE: SLO 1, SLO 2, SLO 3, SLO 4 and SLO 5

BIO 1400 introduces students to fundamental concepts of Biological organizations relative to the molecule and cellular levels. The laboratory practical identifies the learning that has occurred during the semester course.

TARGET:

Expectations are that the BIO 1400 mean test score (20.7/69%) for both the midterm and final laboratory practical.

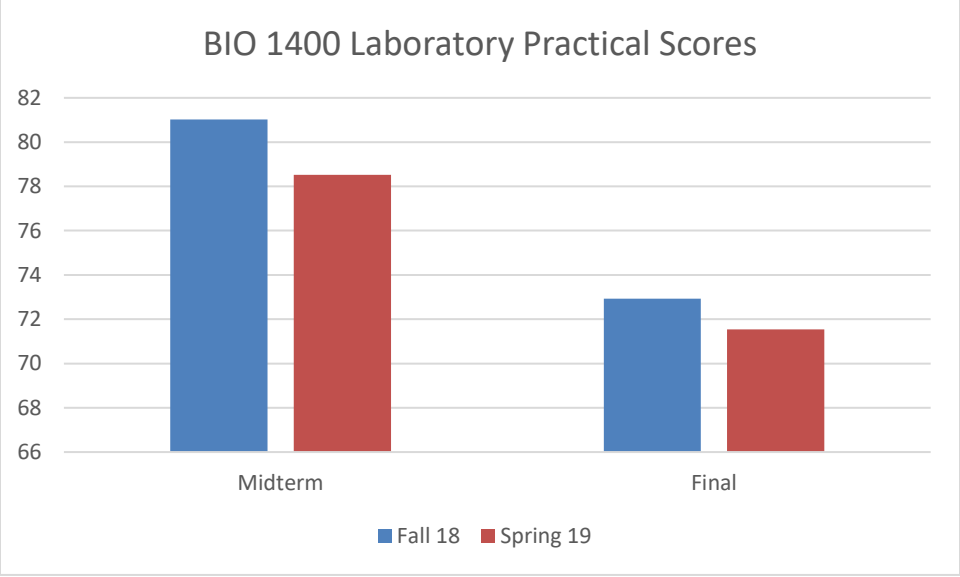
DATA COLLECTION AND RESULTS:

Semester(s): Fall 2018 and Spring 2019

	Fall 2018	**Spring 2019**
Number of students:	105	148
Number of sections:	5	6

Mean scores overall:

Semester	Midterm	Final	Difference
Fall 2018	24.3 (81%)	21.9 (73%)	-2.4 (-8%)
Spring 2019	23.6 (79%)	21.5 (72%)	-1.5 (-7%)



Discussion of Findings: Percent

Scores declined over time for BIO 1400 students for both semesters. The grades for the Fall 2018 semester were slightly higher on both the Midterm (81%) and the Final (73%) compared to the Spring 2019 semester, 79% and 72% respectively. In both semesters, the student average was higher for the Midterm than it was for the Final, but the Spring Semester had a lower drop (-7% vs -8%). The differences between the midterm and the final is expected due to the final having more material compared to the midterm.

Curricular Actions/Closing the Loop:

BIO 1400 is a part of a two semester introduction to Biology for majors. The material covered in this class is expanded on in other courses, such as BIO 3709 Genetics and BIO 3315 Microbiology. Students are able to review and expand upon information learned in BIO 1400 in the upper level classes. For example, the Gram stain is taught in both BIO 1400 and BIO 3315; which would allow for topics that are troublesome for students to learn to be reinforced.

- ✓ **Supporting Evidence (data): Sample Laboratory Practical Questions - Attachment A.**

2. BIO 1300 Lab Report Assessment

DIRECT MEASURE: SLO 1, SLO 2, SLO 3, SLO 4 and SLO 5

Lab reports are considered an integral part of the scientific process. They help to develop skills needed for structuring experiments and communicating results of the scientific method. Three of the seven SLOs (# 2, 3 and 5) are measured with the Lab Report Rubric adopted by Dr. Lorentzen of the Kean Biology faculty. This instrument is used to access required lab work in BIO 1300 and 4970. In BIO 1300, two lab reports (draft and final) are worth 60 points of the final grade.

TARGET:

Expectations are the BIO 1300 lab reports scores will range between 1.0 and 2.0 in all categories for the first assignment and later improve to 2.5 in all areas.

DATA COLLECTION AND RESULTS:

Semester(s): Fall 2018 and Spring 2019

	Fall 2018	**Spring 2019**
Number of students:	207	124
Number of sections:	8	5

Mean scores overall:

	Fall 2018			**Spring 2019**		
Category	**Draft**	**Final**	**Difference**	**Draft**	**Final**	**Difference**
Title	2.5	2.7	**0.2**	2.2	2.5	**0.3**
Abstract	2.1	2.5	**0.4**	1.8	2.3	**0.5**
Intro	2.2	2.5	**0.3**	2.0	2.3	**0.3**
Methods	2.3	2.6	**0.3**	2.0	2.3	**0.4**
Results	2.0	2.4	**0.4**	1.6	2.0	**0.4**
Discussion	2.1	2.5	**0.4**	1.8	2.1	**0.4**
Citation	2.2	2.6	**0.4**	1.8	2.2	**0.4**
Presentation	2.4	2.7	**0.3**	2.1	2.4	**0.3**
Grammar	2.5	2.5	**0.1**	2.2	2.3	**0.2**
Submission	2.8	2.8	**-0.1**	2.5	2.6	**0.1**
Total	23.1	25.8	**2.7**	20	23	**3**

Overall Comparison	Fall 2018			Spring 2019		
	Draft	Final	Difference	Draft	Final	Difference
Title	83%	89%	**6%**	75%	85%	**10%**
Abstract	69%	82%	**13%**	60%	76%	**16%**
Intro	74%	83%	**9%**	67%	77%	**10%**
Methods	77%	88%	**11%**	66%	78%	**12%**
Results	67%	79%	**12%**	55%	68%	**13%**
Discussion	70%	84%	**14%**	60%	72%	**12%**
Citation	72%	85%	**13%**	60%	72%	**12%**
Presentation	79%	89%	**10%**	72%	81%	**9%**
Grammar	82%	84%	**2%**	72%	77%	**5%**
Submission	95%	93%	**-2%**	83%	87%	**4%**
Total	77%	86%	**9%**	67%	77%	**10%**

Overall Comparison	Draft	Final	Difference
Title	79%	87%	**8%**
Abstract	64%	79%	**15%**
Intro	70%	80%	**10%**
Methods	72%	83%	**11%**
Results	61%	74%	**13%**
Discussion	65%	78%	**13%**
Citation	66%	79%	**12%**
Presentation	75%	85%	**9%**
Grammar	77%	81%	**4%**
Submission	89%	90%	**1%**
Mean	72%	81%	**10%**

Discussion of Findings:

The tables feature draft and final report scores for BIO 1300. Results were reported in raw score and percentages. The percentage of improvements between the draft and final report was a 10% gain. Submission realized the least (1%), while Abstract netted a 15% increase.

Curricular Actions/Closing the Loop:

Effective lab report writing is a critical industry standard for Kean students to master before graduation. The Lab Report Rubric, adopted by Dr. Lorentzen of the Biology Program, enables freshmen students to

gain this skill while preparing for academic careers. Furthermore, faculty members are becoming more comfortable with using lab report writing exercises in their courses.

- ✓ **Supporting Evidence (data): Lab Report Rubric and Grading Explanation – Attachment B.**

3. BIO 4970 General Education Assessment

DIRECT MEASURE: SLO 1, SLO 3, SLO 4, SLO 5, SLO 6 and SLO 7

A. BIO 4970: Capstone (Speech) Assessment

DIRECT MEASURE:
The majority of Biology Capstone students have participated in writing grant proposal or research poster presentation for this culminating course. In addition to participating in class reviews, students have been using the university-wide Speaker Evaluation form as a tool to critique each other. Results continued to be immediately shared, in order to improve student communications. The Speaker Evaluation Form successfully accesses student learning outcomes in all areas, except SLO 2. Initially, students were encouraged to review the presentation results of their preliminary research papers (i.e. the Annotated Bibliography), then use the same rubric to measure success of their final presentation. The final presentation mean score was established in 2015 as 3.8/5.0 Overall Mean for Capstone student.

TARGET:
The Overall Mean has continued to serve as a baseline score with students achieving a score of 80% or above.

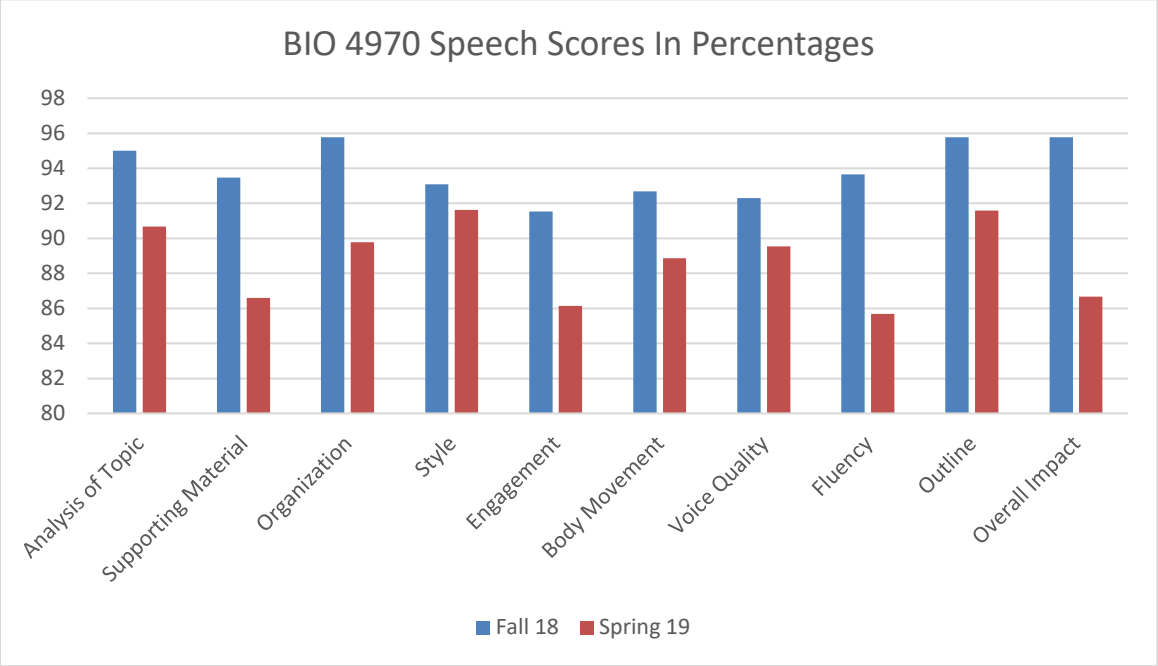
DATA COLLECTION AND RESULTS:
Semester(s): Fall 2018 and Spring 2019

	Fall 2018	**Spring 2019**
Number of students:	55	87
Number of sections:	4	6

<u>Mean scores overall</u>:

Category	**Fall 2018 Mean Score**	**Spring 2019 Mean Score**	**Response Range**
Analysis of Topic	4.8	4.5	5 ± 0
Supporting Material	4.7	4.3	5 ± 0
Organization	4.8	4.5	5 ± 0
Style	4.7	4.6	5 ± 0
Engagement	4.6	4.3	5 ± 0
Body Movement	4.6	4.4	5 ± 0
Voice Quality	4.6	4.5	5 ± 0
Fluency	4.7	4.3	5 ± 0
Outline	4.8	4.6	5 ± 0
Overall Impact	4.8	4.3	5 ± 0

Distribution of Scores: Percent



Distribution of Scores: Raw Scores (Student Success Rate)

Fall 2018	Analysis Topic	Supporting Material	Organization	Style	Engage	Body Move	Voice	Fluency	Outline	Overall Impact
Level 5	39	35	41	34	32	33	33	35	44	42
Level 4	13	17	11	18	18	19	18	16	5	9
Level 3	0	0	0	0	2	0	1	0	3	1
Level 2	0	0	0	0	0	0	0	0	0	0
Level 1	0	0	0	0	0	0	0	0	0	0
Level 0	0	0	0	0	0	0	0	0	0	0

Spring 2019	Analysis Topic	Supporting Material	Organization	Style	Engage	Body Move	Voice	Fluency	Outline	Overall Impact
Level 5	54	52	56	64	42	51	55	48	67	39
Level 4	29	21	23	11	36	30	24	25	10	38
Level 3	3	11	5	8	5	2	5	8	7	10
Level 2	2	2	4	3	5	5	4	6	3	0
Level 1	0	0	0	0	0	0	0	1	1	0
Level 0	0	2	0	0	0	0	0	0	0	0

Discussion of Findings:

In Fall 2018, 96% of students achieved an 80% or higher on their overall score. Spring results showed fewer students (86%) achieving an 80% or above score. Students from the Spring semester scored fewer points in all the categories, with Overall Impact (10%), Supporting Material (8%) and fluency (8%) showing the highest differences.

Curricular Actions/Closing the Loop:
Faculty continue to request that draft presentations be submitted ahead of time for review. Also, students will be advised to practice beforehand and use notecards during their presentations to build confidence and improve Body Movement scores.

- ✓ **Supporting Evidence (Data) is attached: GE Assessment Rubric – Attachment C.**

B. BIO 4970: Capstone (Writing) Assessment

DIRECT MEASURE: SLO 1, SLO 3, SLO 4, SLO 5, SLO 6, and SLO 7

Writing Rubric: Biology Capstone students participate in the writing of a culminating paper based their research interests. The General Education Evaluation form is used by faculty to evaluate the outcomes of this experience based on a standardized format. This rubric is used to evaluate the mechanics of the paper: Genre/Audience, Focus, Development, Organization, Grammar and Revision. Student work is measured based on meeting the following Benchmarks: Level -1, Developmental Level (2-3), and Mastery Level (4-5). It is expected that Capstone students will perform at Levels 3-4 at the beginning of the semester and achieve Levels 4-5 on their final research paper.

TARGET:
The Overall Mean has continued to serve as a baseline score with students achieving a score of 80% or above.

DATA COLLECTION AND RESULTS:

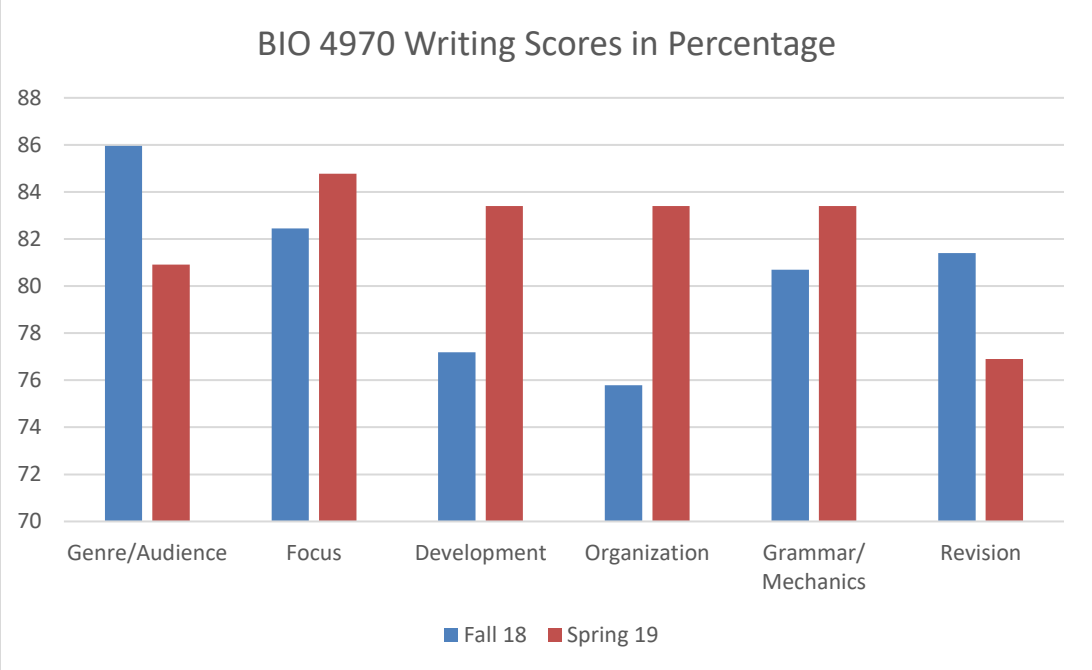
	Fall 2018	**Spring 2019**
Number of students:	55	87
Number of sections:	4	6

Mean scores overall:

Category/Criterion	**Fall 2018**	**Spring 2018**
Genre	4.3	4.0

Focus	4.1	4.2
Development	3.9	4.2
Organization	3.8	4.2
Grammar	4.0	4.2
Revision	4.1	3.8

Distribution of Scores: Percent



Distribution of Scores:

Fall 2017	Genre	Focus	Develop	Organ	Grammar	Revision
Level 5	45	36	23	24	32	34
Level 4	5	13	24	20	16	14
Level 3	0	1	3	4	2	2
Level 2	0	0	0	2	0	0

Level 1	0	0	0	0	0	0
Level 0	7	7	7	7	7	7

Spring 2018	Genre	Focus	Develop	Organ	Grammar	Revision
Level 5	43	36	35	34	44	38
Level 4	10	37	35	37	19	14
Level 3	31	15	16	15	21	23
Level 2	4	0	2	2	4	3
Level 1	0	0	0	0	0	2
Level 0	0	0	0	0	0	4

Discussion of Findings:

During the Fall 2018 semester, 84% (48 of the 57) students reached the 80% or above benchmark. The Spring semester had a smaller percentage of students reaching this benchmark (57%, 50 of 88 students). The Fall semester had 7 students that did not complete the assignment at all. During the Fall 2018 semester, the weakest category was Organization with 77% of the students making a 80% or above. In the Spring 2019 semester, the two weakest categories were Genre (60%) and Revision (62%).

Curricular Actions/Closing the Loop:

In order to support students in improving their writing skills, faculty requested that draft papers be submitted ahead of time for review. Also, students have been advised to work with peers on revisions.

- ✓ **Supporting Evidence (Data) is attached: GE Assessment Rubric – Attachment C.**

Biology 1000
Semester & Year: Fall 2018

REPORT DATE: 12/28/2018

Overview

Transdisciplinarity, quantitative literacy and application of the scientific method in Biology 1000 were assessed by student scores on a departmental general biology assessment exam. To assess writing, a departmental, online writing activity was administered in which students were assessed on the ability to construct a laboratory report.

Student Expectations

Given the introductory nature of the course, the Biology Assessment Committee anticipated that most students would be at the benchmark level for the Transdisciplinarity, Quantitative Reasoning and Writing Rubric categories. As shown below, the minimum level expected is a 61% in all categories, but the goal is at least a 70% for 80% of students.

***Transdiciplinarity* category:**

Number of students: 271
Number of sections: 13

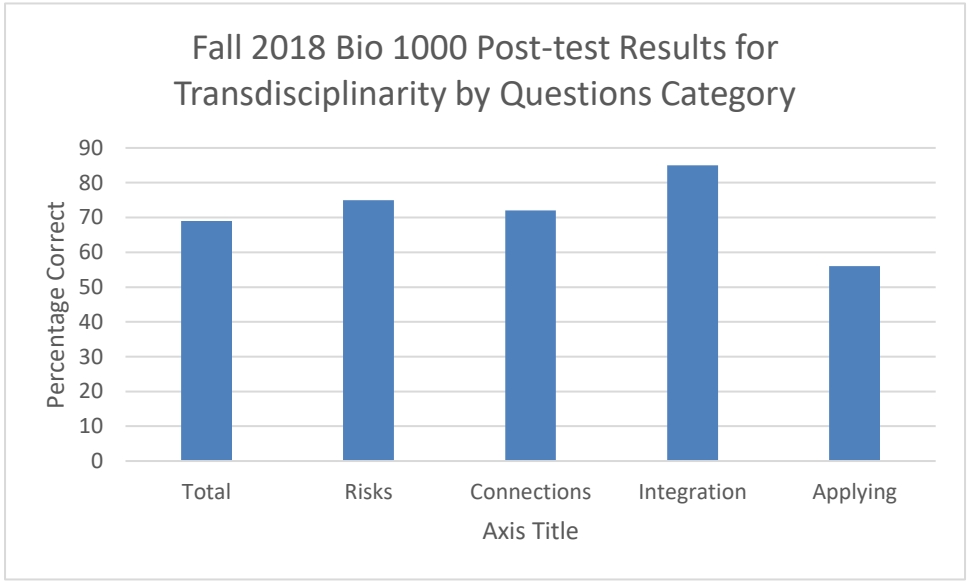
Mean (±SD) scores overall:

Taking Risks (out of 10)	7.52 ± 1.84
Connections to Discipline (out of 10)	7.22 ± 1.92
Integration of Prior Learning (out of 4)	3.39 ± 0.77
Applying Methods and Knowledge (out of 4)	2.22 ± 0.93

Student outcomes aligned with expectations by question

	Taking Risks	**Connections to Discipline**	**Integration of Prior Learning**	**Applying Methods**
0 Below expectations (0-60%)				X
1 Benchmark (61-69%)				
2 Meets expectations (70-79%)	X	X		
3 Meets expectations (80-89%)			X	
4 Exceeds expectations (90-100%)				

Distribution of Scores



Quantitative Literacy
Number of students: 271
Number of sections: 13

Mean (±SD) scores overall:

Interpretation (out of 4)	2.92 ± 0.33
Representation (out of 4)	2.60 ± 0.64
Calculation (out of 4)	2.59 ± 0.73
Application (out of 4)	2.43 ± 0.97
Assumptions (out of 2)*	1.21 ± 0.50
Communication (out of 3)*	2.34 ± 0.77

***n=247**

Student outcomes aligned with expectations by question category:

	Interpretation	**Representation**	**Calculation**	**Application**	**Assumptions**	**Communication**
0 Below expectations (0-60%)						
1 Benchmark (61-69%)		X	X	X		
2 Meets expectations (70-79%)	X				X	X
3 Meets expectations (80-89%)						
4 Exceeds expectations (90-100%)						

Writing
Number of students: 247
Number of sections: 13

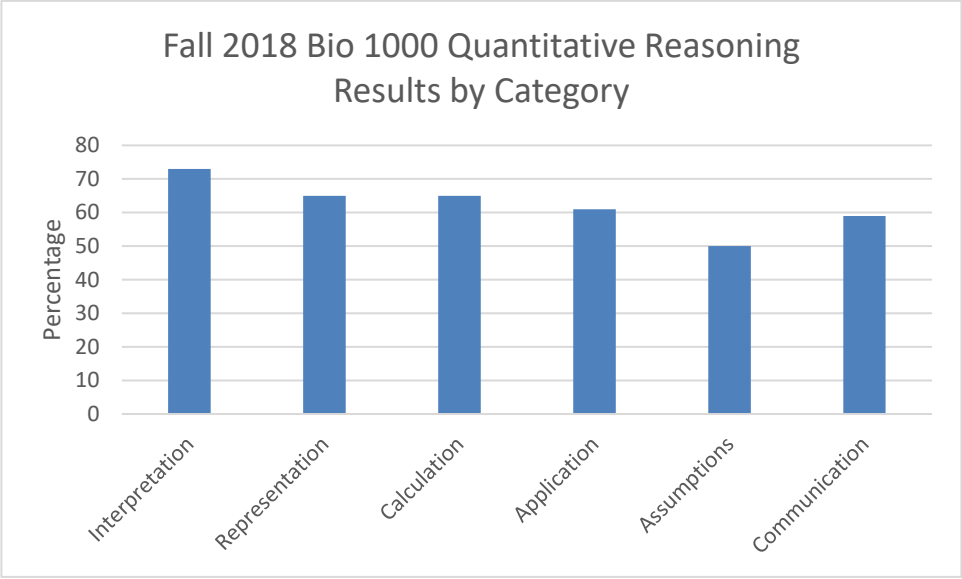
Mean (±SD) scores overall:

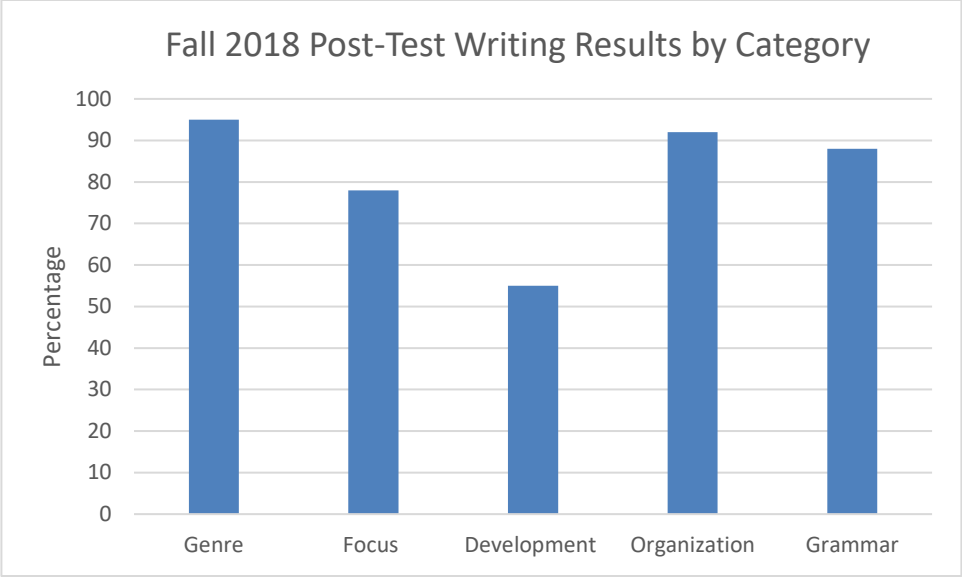
Genre (out of 3)	2.83 ± 1.20
Focus (out of 3)	2.33 ± 0.78
Development (out of 4)	2.45 ± 0.98
Organization (out of 3)	2.77 ± 0.48
Grammar (out of 4)	3.52 ± 0.91

Student outcomes aligned with expectations by question category:

	Genre	Focus	Development	Organization	Grammar
0 Below expectations (0-60%)					
1 Benchmark (61-69%)			X		
2 Meets expectations (70-79%)		X			
3 Meets expectations (80-89%)					X
4 Exceeds expectations (90-100%)	X			X	

Distribution of Scores





Discussion/Action/Closing the Loop:

The Transdisciplinarity Rubric scores students' work as 4 (capstone), 2-3 (milestone) and 1 (benchmark) and includes six categories: curiosity, integration of prior learning, applying methods and knowledge, embracing contradictions and taking risks. Following a Fall 2015 pilot test to link the rubric with the departmental general biology assessment exam given in Biology 1000 each semester, the Biology Assessment Committee determined that the categories for curiosity and embracing contradictions were beyond the scope of Biology 1000 and would instead be assessed within the biology majors' sequence. At the end of the Fall 2018 semester, mean scores met expectations for taking risks and connections to the discipline, were slightly above expectations for integration of prior learning and were just below expectations for applying methods, consistent with the benchmark level for the Transdisciplinarity Rubric. Except for Integration of Prior Learning, all scores were slightly higher than they were in the spring. Like previous semesters, students scored lowest (below 50%) on questions about identifying conclusions, amino acids, glucose and photosynthesis. For the Quantitative Literacy Rubric, students met expectations for Interpretation, Assumptions and Communication and were at Benchmark Level for Representation, Calculation and Application. For the Writing Rubric, students were at Benchmark Level for Development, met expectations for Focus and Grammar and exceeded expectations for Genre and Organization.

As in previous semesters, the instructors were provided with a variety of tools to promote student understanding of real-world applications of biology and improve skills related to quantitative analysis and writing. These included a laboratory manual that directed students to read, discuss and write about science articles, complete related web-based activities, practice graphing, perform simple data analysis and write laboratory reports. It was complemented by a laboratory instructor's manual to assist faculty in implementing these learning strategies and facilitate use of best practices in teaching laboratory exercises across sections of Biology 1000. This was shared with new and continuing faculty, and all were instructed to use these science articles to stimulate class discussion about data interpretation and applications of biology to daily life. Follow-up reminders about post-testing continued throughout the

semester and seemed to improve participation in completing the writing activity. These reminders will continue during the spring 2019 semester.

Biology 1000
Semester & Year: Spring 2019

REPORT DATE: 6/11/2019

Overview

Transdisciplinarity, quantitative literacy and application of the scientific method in Biology 1000 were assessed by student scores on a departmental general biology assessment exam. To assess writing, a departmental, online writing activity was administered in which students were assessed on the ability to construct a laboratory report.

Student Expectations

Given the introductory nature of the course, the Biology Assessment Committee anticipated that most students would be at the benchmark level for the Transdisciplinarity, Quantitative Reasoning and Writing Rubric categories. As shown below, the minimum level expected is a 61% in all categories, but the goal is at least a 70% for 80% of students.

***Transdiciplinarity* category:**

Number of students: 292
Number of sections: 13

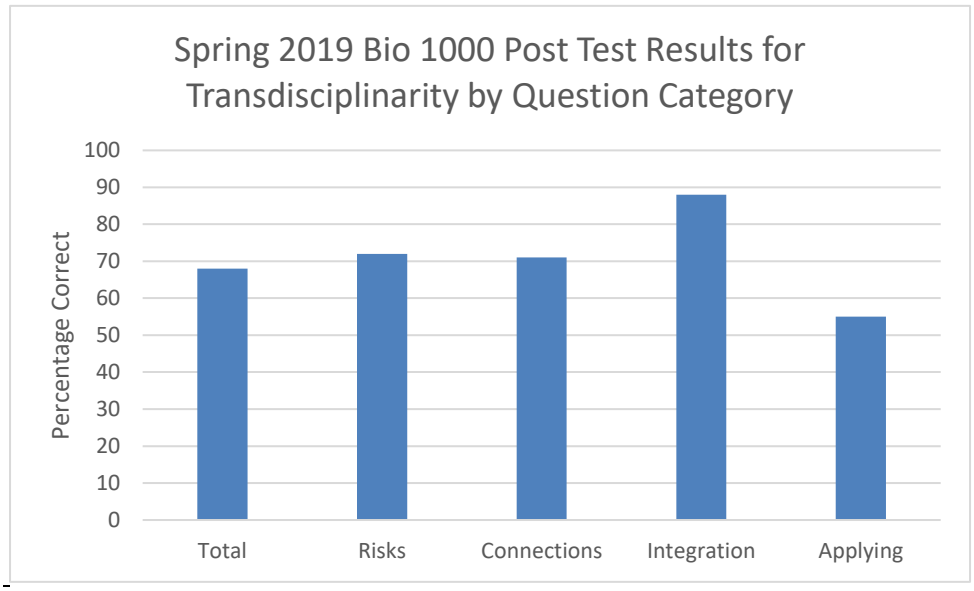
Mean (±SD) scores overall:

Taking Risks (out of 10)	7.21 ± 1.78
Connections to Discipline (out of 10)	7.05 ± 1.89
Integration of Prior Learning (out of 4)	3.52 ± 0.77
Applying Methods and Knowledge (out of 4)	2.20 ± 0.99

Student outcomes aligned with expectations by question

	Taking Risks	**Connections to Discipline**	**Integration of Prior Learning**	**Applying Methods**
0 Below expectations (0-60%)				X
1 Benchmark (61-69%)				
2 Meets expectations (70-79%)	X	X		
3 Meets expectations (80-89%)			X	
4 Exceeds expectations (90-100%)				

Distribution of Scores



Quantitative Literacy
Number of students: 291
Number of sections: 13

Mean (±SD) scores overall:

Interpretation (out of 4)*	2.91 ± 0.35
Representation (out of 4)	2.73 ± 0.53
Calculation (out of 4)	2.60 ± 0.71
Application (out of 4)	2.45 ± 0.94
Assumptions (out of 2)	1.62 ± 0.48
Communication (out of 3)	2.34 ± 0.77

***n=299**

Student outcomes aligned with expectations by question category:

	Interpretation	Representation	Calculation	Application	Assumptions	Communication
0 Below expectations (0-60%)						
1 Benchmark (61-69%)		X	X	X		
2 Meets expectations (70-79%)	X					X
3 Meets expectations (80-89%)					X	
4 Exceeds expectations (90-100%)						

Writing
Number of students: 231
Number of sections: 13

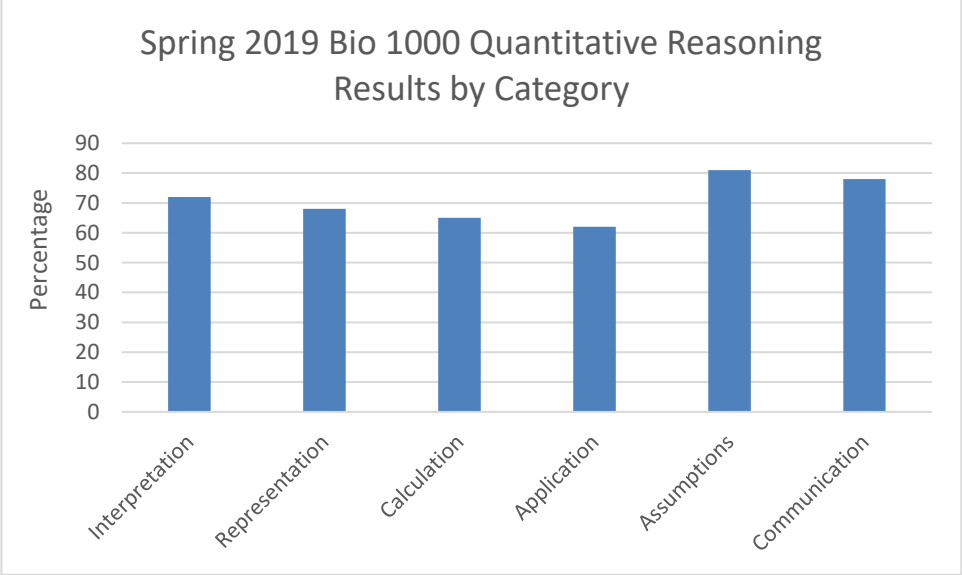
Mean (±SD) scores overall:

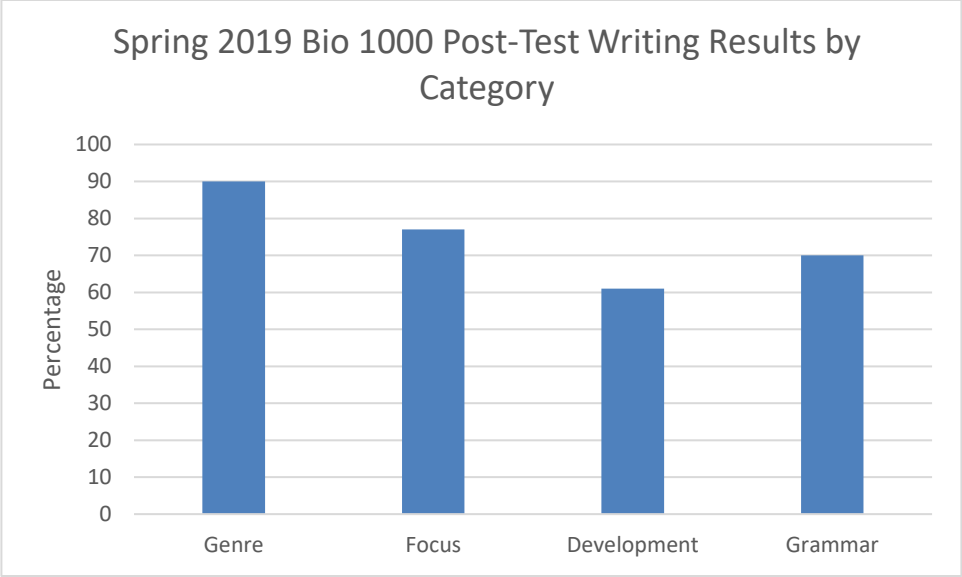
Genre (out of 3)	2.71 ± 0.64
Focus (out of 3)	2.31 ± 0.77
Development (out of 4)	2.45 ± 0.94
Organization (out of 3)	2.80 ± 0.46
Grammar (out of 4)	2.80 ± 0.44

Student outcomes aligned with expectations by question category:

	Genre	Focus	Development	Organization	Grammar
0 Below expectations (0-60%)					
1 Benchmark (61-69%)			X		
2 Meets expectations (70-79%)		X			X
3 Meets expectations (80-89%)					
4 Exceeds expectations (90-100%)	X			X	

Distribution of Scores





Discussion/Action/Closing the Loop:

The Transdisciplinarity Rubric scores students' work as 4 (capstone), 2-3 (milestone) and 1 (benchmark) and includes six categories: curiosity, integration of prior learning, applying methods and knowledge, embracing contradictions and taking risks. Following a Fall 2015 pilot test to link the rubric with the departmental general biology assessment exam given in Biology 1000 each semester, the Biology Assessment Committee determined that the categories for curiosity and embracing contradictions were beyond the scope of Biology 1000 and would instead be assessed within the biology majors' sequence.

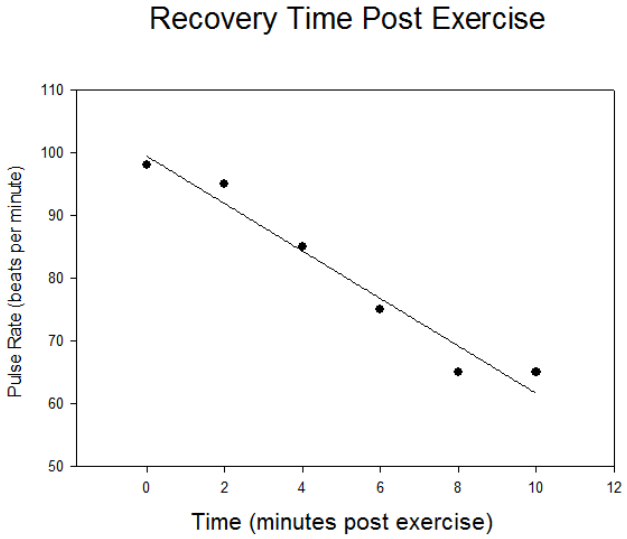
At the end of the Spring 2019 semester, mean scores met expectations for taking risks and connections to the discipline, were slightly above expectations for integration of prior learning and were just below expectations for applying methods, consistent with the benchmark level for the Transdisciplinarity Rubric. Scores were similar to those from previous semesters. Like previous semesters, students scored lowest (below 50%) on questions about identifying conclusions, glucose and photosynthesis. Scores improved on a question about amino acids. For the Quantitative Literacy Rubric, students met expectations for Interpretation, Assumptions and Communication and were at Benchmark Level for Representation, Calculation and Application. For the Writing Rubric, students were at Benchmark Level for Development, met expectations for Focus and Grammar and exceeded expectations for Genre and Organization.

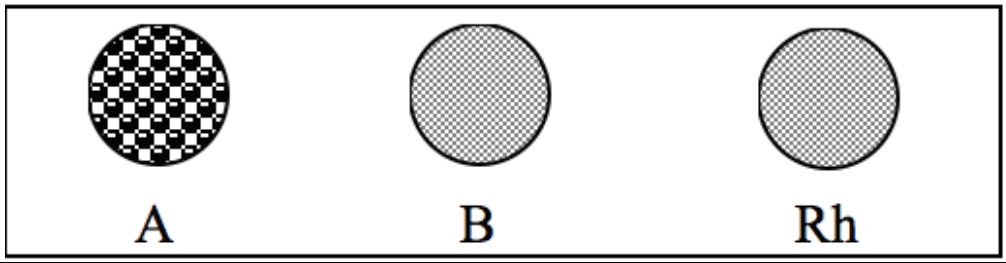
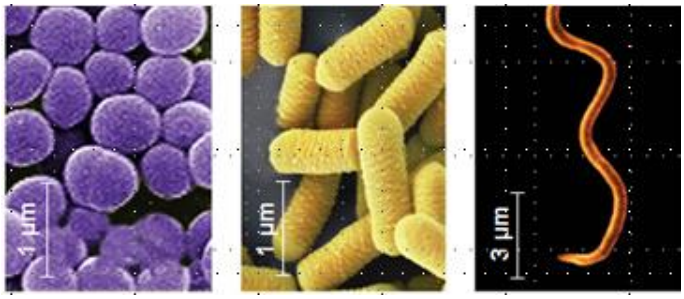
As in previous semesters, the instructors were provided with a variety of tools to promote student understanding of real-world applications of biology and improve skills related to quantitative analysis and writing. These included a laboratory manual that directed students to read, discuss and write about science articles, complete related web-based activities, practice graphing, perform simple data analysis and write laboratory reports. It was complemented by a laboratory instructor's manual to assist faculty in implementing these learning strategies and facilitate use of best practices in teaching laboratory exercises across sections of Biology 1000. This was shared with new and continuing faculty, and all were instructed to use these science articles to stimulate class discussion about data interpretation and applications of biology to daily life. Follow-up reminders about post-testing continued throughout the

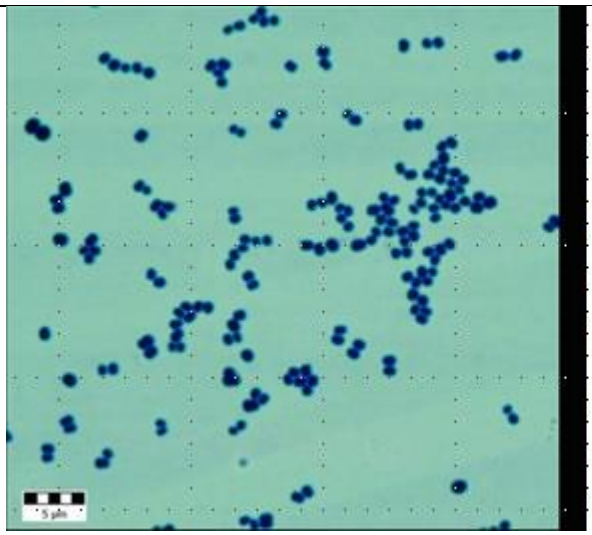
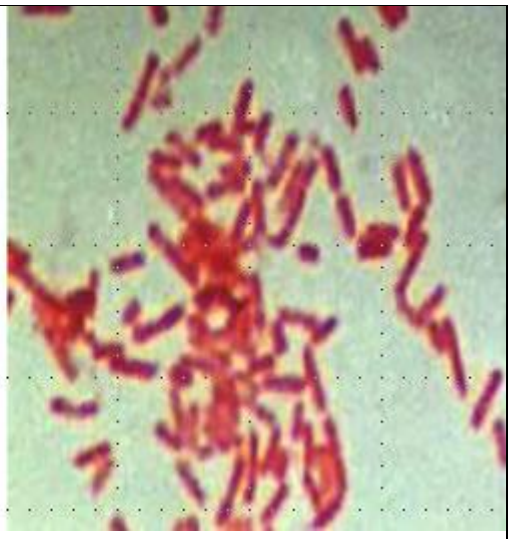
semester and seemed to improve participation in completing the writing activity. These reminders will continue during the fall 2019 semester.

Attachment A

Questions from BIO 1400 Lab Practical

STATION #1	 **Q#1: State the dependent variable from the graph above _____.**
STATION #2	Hypothesis A: • Smokers do not have poorer cardiovascular fitness than do non-smokers Hypothesis B: • Smokers do have poorer cardiovascular fitness than do non- smokers **Q#2: Which hypothesis, A or B, is the NULL HYPOTHESIS?**
STATION #3	For the Cheek cell DNA extraction lab, the steps you performed, in order, were: 1st Harvest & lyse open cells 2nd Break down/remove proteins 3rd Make DNA insoluble 4th Precipitate the DNA **Q#3: Which of these steps (# 1, 2, 3 or 4) requires alcohol use?**
STATION #4:	**Q#4: Kim and Kanye are carriers for Cystic Fibrosis (CF). Cystic Fibrosis is an autosomal recessive disorder. What is the probability that baby Saint West has CF? Show your work!** A. 100 % B. 75 % C. 50 % D. 25% E. 0 %
STATION #5	**Q#5: Two parents mate and produce offspring. These offspring are referred to as which of the following?** A. P generation B. F_1 generation C. F_2 generation D. None of the above
STATION #6	A sexually reproducing animal has two unlinked genes, one for head shape (*H*) and one for tail length (*T*). Its genotype is *HhTt*. **Q#6: Which of the following genotypes is possible in a gamete from this organism?** *A) Hh B) HhTt C) T D) HT*
STATIO	**Q#7: Rachel has type AB blood. Ross has type O blood. If they mate, what is the**

N #7	**probability that their offspring will have type A blood?** A. 100 % B. 75 % C. 50 % D. 25 % E. 0%
STATION #8	**Q#8: If you have type AB blood, you can receive blood from which of the type(s) below?** A. A B. B C. AB D. O E. None of these F. All of these
STATION #9	**Q#9: Examine the blood typing slide below. What is this individual's blood type?** **This figure shows the agglutination reaction of ABO Blood-Typing Sera. Key: The black balls in "A" represent agglutination occurring in the Anti-A serum.** *Hint: Clumping in this well only* 
STATION #10	**Q#10: Below are shown the three shapes of prokaryotes. Which shape are the bacilli?** A. A B. B C. C D. None of these  **A** **B** **C**
STATION #11	**Q#11: Below are microscope images of bacterial gram staining. Which image shows Gram + bacteria?** A. A B. B C. Neither D. Both

	  **A** **B**
Station #12:	**Q #12. Are bacteria and Archaea considered prokaryotic or eukaryotic organisms?**
Station #13:	**Q#13. The purpose of adding a(n) _____ is to dissolve the phospholipid membranes of the cell.** A.Protease B.Lysis Buffer C. Salt D.Cold Alcohol E. Potato Chip
Station #14:	*A scientist testing the affects of a pesticide spray on a corn crop yield, sprays a cornfield with pesticide "X." A second cornfield does not receive the chemical. The amount of corn harvested from the field is measured.* **Q #14: In order for the corn field experiment to be valid scientifically, both fields must:** A. receive the same amount of sunlight B. receive the same amount of water C. have the same type of corn D. Choice A and B only E. All of the above
Station # 15:	**Q#15A. Cell wall composition differs between Gram + and Gram- bacteria due to various reasons mentioned in lab. One structural difference is that Gram - bacteria has a_____layer of peptidoglycan in its cell wall.** A)Thick B) Thin **Q15#B. A person has type B blood. Which agglutinin(s) (Antibody(ies)) are present in this person's blood?** A) A B) B C) A and B D) Neither A or B E) All of the above

ATTACHMENT B Example: LAB REPORT RUBRIC

General Bio Lab Report Grading Rubric

STUDENT: _____

(1/2015 Lorentzen modified J.K. Brown's 2011 *Biotechnology A Laboratory Skills Course* 1st ed. BIORAD, Hecules CA, p.372)

Objective	Novice (1)	Developing (2)	Proficient (3)
Title Page	Title Page missing or largely incomplete.	Title Page present but incomplete and/or title not descriptive and precise.	Stand-alone title page is complete and includes precise & descriptive title of work, author's name, names of lab partners, course name & date of submission.
Abstract	Abstract only summarizes the introduction of the report.	Abstract presents information from only some portions of the report.	Abstract represents a concise full summary of all parts of the report.
Introduction	Introduction does not sufficiently address both the experimental purpose/objective/hypothesis and the relevant background matter.	Introduction addresses only the purpose/objective/hypothesis of the work or else only the background information, but not both.	Introduction addresses the experimental purpose/objective(s)/hypothesis & defines the background information relevant to the subject matter.
Methods	Methods are incompletely described.	Methods are described in most experiments but another person may have trouble repeating the experiments as not enough detail provided.	Methods are described completely such that another person could easily repeat the experiment.
Results	Data presentation is vastly incomplete as either only illustrations provided without written narrative or only written narrative provided without illustrations.	Data presentation of illustrations as well as written results narrative, but one or more are incomplete or not formatted correctly.	All appropriate illustrations (figures/tables) are presented and include Illustration # and title/legend. Data obtained are presented in formal written narrative that precedes illustrations.
Discussion	No account of potential sources of error. No conclusion. Data analysis and interpretation of data lacking.	Analysis and interpretation of data that is not sufficiently thorough, and/or content of results and discussion are not correctly separated. Insufficient conclusion.	Data/results are analyzed in light of known findings and are interpreted in the context of either the stated hypothesis or experimental purpose/objective. Sources of potential error are discussed. Sufficient conclusion.
Literature Cited & Originality	No attribution to any other work is provided, and/or the writing is plagiarized.	Terminal Reference listed but either incomplete format and/or missing/incorrect format for in-text citation in the narrative.	Correct format used for both in-text citation in the narrative (introduction, methods) as well as Terminal Reference list.
Presentation of Report	More than one of the items listed to the right for proficient level not met.	One of the items listed to the right for proficient level not met.	Double spaced, reasonable page margins, page #s, section subheaders, neat/orderly professional appearance.
Grammar	Significant portion of report has grammar/spelling/punctuation and/or typographical issues.	Some grammar/spelling/punctuation and/or typographical issues.	Few to none issues related to grammar/spelling/punctuation and typographical issues. Style & tone of writing is at appropriate level.

Submission Deadline	Lab report submitted very late.	Lab report submitted late.	Lab report submitted by the stated deadline.

Score earned on DRAFT lab report: _____ out of 30 points possible

SCORE EARNED ON FINAL LAB REPORT: _____ out of 30 points possible

NOTE THAT WHEN SUBMITTING FINAL LAB REPORT, YOU MUST ALSO SUBMIT THE GRADED DRAFT LAB REPORT + GRADED RUBRICS FOR DRAFT REPORT. OTHERWISE, POINTS WILL BE DEDUCTED.

Style Guide for Writing a Formal Biology Lab Report

(Compiled from a multitude of sources SP14 by Dr. Lorentzen, Kean University, revised summer 2014)

Overview of How to Format the Lab Report

Lab reports are expected to be typed on a computer, printed out, either stabled or paper clipped together and submitted to your instructor. Use double-spacing 11 or 12 point font for the document's narrative, while single spacing in illustrations is fine. Margin settings should be standard settings (likely 1 or 1 ½ inch). Multipage documents need page numbers. All illustrations must have a figure # (this includes both tables and graphs); tables also must have a title and other figures such as graphs must have both a title and a figure legend. Graphs are to be done on the computer but maybe submitted hand drawn if done so on graph paper. Proper grammar mechanics and spelling is expected along with paragraph organization for the written narrative.

Scientific writing is to be clear and concise as it is distinctly different from creative prose writing. Word choice is to be exact. You may write "I/we" rather than using third person (i.e. "the researcher did")….whichever you opt to you be consistent in use throughout the document. However, if you write such that every other sentence is "we did this….we did that…" you distract the reader from the work done so instead rearrange sentence structure where possible. While some scientists will say you have to use third person narrative, over the last decade or so, more and more scientists and professional journals encourage the use of I/we as I do. Note that numbers should be written as numerals when the number is greater than 10 or when associated with a unit of measurement. Never start a sentence with a number unless the number (no matter how large) is spelled out. It is best to use PAST TENSE OF THE VERB when writing your lab report.

Components of the Lab Report

COVER PAGE provides a descriptive TITLE, your name, lab partner's names, course name/number including section # and date of submission.

ABSTRACT is a single paragraph that is a concise but specific summary of each section of the lab report. While the abstract appears before the introduction in terms of placement in the report, it is common practice to actually write the abstract last once the rest of the report is done.

INTRODUCTION section provides relevant background information to understand what the lab report contains herein. It also must include a specific PURPOSE STATEMENT (or objective) of the work done and where applicable, your HYPOTHESIS.

Here is more information on how to compose a hypothesis:

Formulate your Research Hypothesis Statement as "IF….., THEN….." whereby your hypothesis follows the "if" & the "then" is followed by a possible testable possibility. Ex.: If rising carbon dioxide levels are contributing to global warming, then there should be a directly observable correlation between carbon dioxide content in the atmosphere & world temperature variation.
METHODS section is a formal narrative written in paragraph format that presents how the experiments were done such that a person of science could be reasonably expected to repeat them. You write how you did what you did, and you also include how you collected/analyzed the data obtained.
RESULTS section is where you report the data obtained in an unbiased manner. You may include illustrations of data. However, you still need formal narrative written in paragraph format in which you tell what your data is while referring to any given numbered figures. For example, a sentence within a paragraph of your results section might be as follows: Figure 1 shows the production of carbon dioxide decreased after five minutes.
DISCUSSION section is where you interpret the data….what does the data obtained mean/imply? Does the data support your hypothesis or not? Explain. If relevant, how do your results compare with the expected results? What might be considered sources of potential error or what problems occurred while conducting the work? The lab manual may pose discussion questions on which you can reflect. Do not simply put answers to such questions in your lab report discussion section. Instead, use any discussion questions as a guide on a way to incorporate material into your formal written discussion narrative. The discussion must end with a brief and concise CONCLUSION that should be in synch with the stated purpose and/or hypothesis stated in the lab report. The conclusion should state the major finding(s) of the work, but it is NOT to be a summary of the entire work.
LITERATURE CITED section is the full reference listing of all sources that appear as in-text citation anywhere in the document. At a minimum, you should in your methods section in-text cite the lab manual used for the methods. Other sections in which citation maybe relevant is the introduction and discussion. All work contained in the lab report is to be the original writing of the student author. Paraphrases should be in-text cited and direct quotes contained within quotation marks.
<u>The Name/Year Method for in-text citation is expected. Examples follow:</u>
The gene we describe in this report is identical to the one first isolated in 1989 (Smith, 1991).

The incidence rate for cancer in 2010 in NY was higher than that of NJ (CDC, 2010).

<u>Examples of in-text citation just given (which are likely a sentence in the introduction section of the lab report), have their full reference listings in the Literature Cited section as below:</u>

CDC (2010) Centers for Disease Control & Prevention Website. Cancer prevention and control, cancer rates by state, incidence rates by state. [updated 24 Oct 2013] Accessed 13 June 2013 Available from: http://www.cdc.gov/cancer/dcpc/data/state.htm

Smith, J. (1991) The pretend gene as a candidate for the cause of pretend disease. *Journal of Biology.* 47:113-117.

In the Name/Year system, references appear in alphabetical order in the Literature Cited Section of the lab report.

ATTACHMENT C

SPEECH RUBRIC

SPEAKER EVALUATION FORM

Name of Speaker _____ **Section** _____

Student ID _____ **Speech (1 or 2)** _____

Key: 1=Unacceptable 2=Fair 3=OK/acceptable 4=good/above average 5=Excellent

Rating	Item	✓ = Positive, Effective 0 = Needs Work		Comments
CONTENT				
	Analysis of Topic (Critical Thinking)	__Clear purpose __Clear central idea __ Multiple perspectives represented	__Relevant topic ___Aware of possible objections to claims	
	Supporting Material	__Credible sources __ Cited sources	__Varied sources __Sufficient sources __Appropriate visual aid	
	Organization	__Introduction __ Main points clear	__Transitions __Conclusion	
	Style	__Defined terms __ Used metaphors, analogies	__Grammar __Avoids clichés, jargon __Precise vocabulary	
DELIVERY				
	Engagement	__Audience awareness __Eye contact	__Poise __Manages anxiety	
	Body Movement	__ Posture __ Gestures	__Facial expression __Use of space	
	Voice Quality	__ Volume __ Variety in tone	__Extemporaneous __ Articulation __Vocal control	
	Fluency	__ Freedom from notes __ Avoids vocal fillers	__Effective pace __ Effective use of Pauses	
PREPARATION				
	Outline	___Structure	___Bibliography ___Annotation	
IMPACT				
	OVERALL IMPACT	__Speaker is credible __ Appropriate use of time	__Speech is memorable __Speech accomplishes purpose	
	FINAL GRADE			

Revised 2013

WRITING RUBRIC

Writing Rubric

Student Name: _____ Score : _____
Kean ID: _____

Course and Section: _____Instructor's name: _____

Criteria	5	4	3	2	1	0	Total
Genre/Audience							
Focus							
Development							
Organization							
Grammar/Mechanics							
Revision							

Descriptors for Rubric: Condensed

	5	4	3	2	1	0
Genre/Audience	Uses conventions in skillful way	Uses conventions in somewhat skillful way	Uses conventions in formulaic way	Does not follow conventions consistently	Fails to follow most or any conventions	Not applicable
Focus	Explicit, nuanced, complex stance	Explicit and nuanced, but not complex, stance	Stance defined in general terms	Vague stance	No clear stance	Not applicable
Development	All ideas developed with specific, relevant information.	Most ideas developed with specific, relevant information. Reader raises few questions	Ideas not developed consistently. Supported with vague generalization or inappropriate examples	Most ideas not developed or supported with inappropriate examples.	Ideas stated, not developed	Not applicable
Organization	Structure imparts feeling of wholeness and skill	Structure imparts a feeling of wholeness but not skill	Structure breaks down in some places, though solid overall	Structure feels rough or unclear	Structure clear or confusing	Not applicable
Grammar/mechanics	Few or no errors exist; those present have no effect on reading	Errors obvious but not distracting	Errors begin to interfere with reading	Several distracting errors or multiple patterns of error	Numerous errors make understanding text difficult or impossible	Not applicable
Revision	Almost all revisions make draft stronger	Most revisions make draft stronger	Some revisions strengthen, but some weaken draft	Few revisions, with little effect on quality	Very few revisions; may make final worse	No evidence of revision

Descriptors for Rubric

This document contains an expanded explanation of the criteria making up the baseline and portfolio evaluation rubrics for College Composition (revised Summer 2011). Each criterion is briefly defined and linked to common terms used for it in composition textbooks. Characteristics of each level in a criterion are also included.

Genre/Audience: The writing demonstrates an understanding of the conventions of the genres they are writing as well as for academic writing in general. See p. 44 for the conventions of the required genres.

Terms related to this criterion: conventions, community of readers, discourse community, genre, style, tone

- Score of 5: the writer follows all or almost all of the conventions for the genre and academic writing in general. In addition, the writer demonstrates a skillful ability to manipulate those conventions in ways that make their work stand out while still fulfilling the reader's expectations.
- Score of 4: the writer follows most, if not all, of the conventions for the genre and academic writing in general. There is evidence of effort made to manipulate those conventions in ways that make their work stand out while still fulfilling the reader's expectations. However, those efforts are not as skillful as a level-five essay.
- Score of 3: the writer follows most of the conventions. However, they do so in a formulaic way that shows little attempt to engage the audience.
- Score of 2: the writer follows most of the conventions but does not do so consistently. They may also not follow some conventions, but the reader gets the sense the writer understands the conventions.
- Score of 1: the writer fails to follow most or any of the genre conventions and of academic writing in general.

Focus: The writing presents a unified, clear stance with respect to the characteristics of the assignment. In a given essay, each paragraph relates to that stance.

Terms related to this criterion: main idea, purpose, stance, thesis statement

- Score of 5: explicit, nuanced stance. The reader feels like the writer has constructed a complex, well thought-out point.
- Score of 4: stance is explicit and/or nuanced, but not to the degree of a five. The reader may feel like some minor points are missing or that the stance could be more complex.
- Score of 3: stance somewhat clear, but may be defined in general terms (i.e. "subject A and B are a like in some ways and different in others" or "I agree/disagree with X" without giving reasons for their stance)
- Score of 2: vague stance or purpose. It may only apply to part of the piece.
- Score of 1: no clear stance or purpose.

Grammar/Mechanics: the essay follows the conventions of Edited Academic English. This includes conventions for citing sources, regardless of the system used. An essay does not have to be perfect to receive a score of 5 in this criteria. Instead, consider whether the errors would either distract an average reader or make them doubt the writer's credibility.

Terms related to this criterion: diction/word choice, documentation, punctuation, sentence boundaries, sentence structure, spelling

- Score of 5: errors do not detract from the essay's central focus and from the smooth delivery of the writer's ideas. Few or no errors exist, and those that appear are minor or reflect obscure rules.
- Score of 4: errors are obvious but not to the point of distracting an average reader.
- Score of 3: grammatical, mechanical, spelling, and documentation errors begin to interfere with understanding the text's meaning. Patterns of status-marking error may exist (ex. sentence boundaries, verb endings).
- Score of 2: several distracting grammatical, mechanical, spelling, and documentation errors make understanding the text's meaning difficult. Multiple patterns of error exist.
- Score of 1: numerous distracting grammatical, mechanical, spelling, and documentation errors make understanding the text's meaning difficult or impossible.

Revision: the writer made changes between drafts to the essay's focus, organization, development, and/or style that lead to a more successful final essay. These changes can take place at any level of the text (overall, paragraph, or sentence). Invention and planning work used to create a rough draft counts as evidence of revision.

Terms related to this criterion: addition, deletion, substitution, and rearrangement. (Note: The last two are not done as often, even when they are needed.)

- Score of 5: almost all of the revisions make the final draft stronger than the original. The writer used all four forms of revision as appropriate.
- Score of 4: Most, but not all, of the revisions make the final draft stronger than the original. The writer used most of the forms of revision, but may have needed to use others. (ex. the added and deleted material, but should have also rearranged it).
- Score of 3: the draft includes some revisions that make the final draft stronger, but others are needed. The writer mostly used addition and deletion, even if substitution and rearrangement was also needed. Some of the revisions may distract from the draft's quality.
- Score of 2: The draft includes few revisions, most of which have no influence on the final draft's quality. The writer may have used only one form of revision even though others are needed.
- Score of 1: the draft includes very few revisions; most either have no influence on the final draft's quality or make it worse. It seems like the writer just retyped the original draft.
- Score of 0: no evidence of revision. The writer turned in only one draft and no invention/planning work.